# THE IMPACT OF CONJUGATED LINOLEIC ACID ADDITION ON PH VALUE OF LONGISSIMUS DORSI MUSCLE

# WPŁYW DODATKU SPRZĘŻONEGO KWASU LINOLOWEGO NA WARTOŚĆ PH MIĘŚNIA LONGISSIMUS DORSI

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Manuscript received: July 31, 2008; Reviewed: January 14, 2009; Accepted for publication: February 24, 2009

## ABSTRACT

The subject of research was 60 crossbred gilts, divided into 6 groups, fed the fodder with addition of conjugated linoleic acid (CLA) or sunflower oil (SFO) in amount: 0.5; 1.0; and 2.0 %, respectively. Animals were slaughtered with the body weight ca. 95 kg. The aim of research was to determine pH value of loin meat tissue (Longissimus dorsi) of right half-carcass in 45 minutes, 2, 3, 4, 5, 6 hours and 24 hours after slaughter. Results were statistically elaborated using one-way variance analysis. Longissimus dorsi muscle pH values measured 45 minutes after slaughter in case of all groups of pigs were in range from 6.34 up to 6.47, what shows good meat quality. The lowest $pH_1$ (measured 45 minutes after slaughter) had meat of fatteners where addition of 2 % sunflower oil was given into fodder and the highest value of this trait was in group of individuals where also was given sunflower oil in 1 % amount. Statistical significant differences in pH value measured in different time after slaughter i.e. after 45 minutes, 2, 3, 4, 6 and 24 hours between tested groups of pigs were not stated. The exception is the result of pH measurement 5 hours after slaughter. Statistical significant differences were between group of pigs getting 0.5 % addition of conjugated linoleic acid characterized by the highest pH value of meat and group of animals fed the fodder with 1 % addition of conjugated linoleic acid ($P \leq 0.01$). On the basis of the results obtained in presented paper may be stated that feeding pigs with addition of conjugated linoleic acid in amounts 0.5; 1.0 and 2.0 % did not impact negatively on meat quality defined by pH value.

Key words: pigs, conjugated linoleic acid, sunflower oil, meat, pH

## ABSTRAKT

Przedmiotem badań było 60 loszek mieszańców, podzielonych na 6 grup, żywionych paszą z dodatkiem sprzężonego kwasu linolowego (CLA) lub oleju słonecznikowego (SFO) w ilościach odpowiednio: 0,5; 1,0 oraz 2,0 %. Zwierzęta ubito przy masie ciała ok. 95 kg. Celem pracy było określenie stopnia zakwaszenia tkanki mięśniowej schabu (Longissimus dorsi) prawej półtuszy w 45 minut, 2, 3, 4, 5, 6 godzinie oraz 24 godziny po uboju. Statystyczne opracowanie wyników przeprowadzono stosując jednoczynnikową analizę wariancji. Wartości pH mięśnia najdłuższego grzbietu mierzone 45 minut po uboju w przypadku wszystkich grup świń mieściły się w przedziale od 6,34 do 6,47, co świadczy o dobrej jakości mięsa. Najniższym $pH_1$ odznaczało się mięso tuczników, w której do paszy podawany był 2 % dodatek oleju słonecznikowego, a najwyższa wartość tej cechy wystąpiła w grupie osobników, którym również podawano olej słonecznikowy w dawce 1 %.

Nie wykazano także statystycznie istotnych różnic w kwasowości mięsa mierzonej w różnym czasie od uboju, tj. po 45 minutach, 2, 3, 4, 6 i 24 godzinach między badanymi grupami świń. Wyjątkiem jest wynik pomiaru pH 5 godzin po uboju. Statystycznie istotne różnice wystąpiły bowiem między grupą świń otrzymującą dodatek 0,5 % sprzężonego kwasu linolowego charakteryzującą się najwyższym pH mięsa, a grupą zwierząt karmioną paszą z 1 % dodatkiem sprzężonego kwasu linolowego ($P \leq 0,01$).

Na podstawie wyników uzyskanych w prezentowanej pracy można stwierdzić, że żywienie świń z dodatkiem sprzężonego kwasu linolowego w ilościach 0,5; 1,0 oraz 2,0 % nie wpływa negatywnie na jakość mięsa określaną na podstawie wartości pH.

Słowa kluczowe: świnie, sprzężony kwas linolowy, olej słonecznikowy, mięso, pH

## DETAILED ABSTRACT

Przedmiotem badań było 60 loszek mieszańców [♂ irlandzka uszlachetniona krajowa x ♀ (♂ irlandzka uszlachetniona krajowa x ♀ wielka biała irlandzka)], podzielonych na 6 grup liczących od 10 do 14 osobników w każdej, żywionych paszą z dodatkiem sprzężonego kwasu linolowego (CLA) lub oleju słonecznikowego (SFO) w ilościach odpowiednio: 0,5; 1,0 oraz 2,0 %. Celem pracy było określenie stopnia zakwaszenia tkanki mięśniowej schabu (Longissimus dorsi) prawej półtuszy w 45 minut, 2, 3, 4, 5, 6 godzinie oraz 24 godziny po uboju. Tucz świń rozpoczęto przy masie ciała ok. 40 kg i prowadzono przez 8 tygodni. Podczas jego trwania stosowano żywienie do woli. Zwierzęta ubito przy masie ciała ok. 95 kg. W 45 minut, 2, 3, 4, 5, 6 godzinie oraz 24 godziny po uboju określono stopień zakwaszenia tkanki mięśniowej schabu (Longissimus dorsi) prawej półtuszy. Statystyczne opracowanie wyników przeprowadzono stosując jednoczynnikową analizę wariancji. Wartości pH mięśnia najdłuższego grzbietu mierzone 45 minut po uboju w przypadku wszystkich grup świń mieściły się w przedziale od 6,34 do 6,47, co świadczy o dobrej jakości mięsa. Mimo, że nie stwierdzono statystycznie istotnych różnic między badanymi grupami świń, to najniższym $pH_1$ odznaczało się mięso tuczników, w której do paszy podawany był 2 % dodatek oleju słonecznikowego, a najwyższa wartość tej cechy wystąpiła w grupie osobników, którym również podawano olej słonecznikowy w dawce 1 %. Nie wykazano także statystycznie istotnych różnic w kwasowości mięsa mierzonej w różnym czasie od uboju, tj. po 2, 3, 4, 6 i 24 godzinach między badanymi grupami świń. Wyjątkiem jest wynik pomiaru pH 5 godzin po uboju. Statystycznie istotne różnice wystąpiły bowiem między grupą świń otrzymującą dodatek 0,5 % sprzężonego kwasu linolowego charakteryzującą się najwyższym pH mięsa, a grupą zwierząt karmioną paszą z 1 % dodatkiem sprzężonego kwasu linolowego ($P \leq 0,01$). Na podstawie wyników uzyskanych w prezentowanej pracy można stwierdzić, że żywienie świń z dodatkiem sprzężonego kwasu linolowego w ilościach 0,5; 1,0 oraz 2,0 % nie wpływa negatywnie na jakość mięsa.


## INTRODUCTION

The main aim of pig breeding and production is to obtain animals characterized by low fat and high meat content retain their good meat quality [9]. The pH value through the impact on muscle proteins is the main determinant of meat quality, influencing on water holding capacity, colour, tenderness, taste and durability. It serves for diagnosis of correct glycolysis process and also states meat defects like PSE and DFD. Using fodder additions as i.e. conjugated linoleic acid (CLA) may be one of the ways of improving pork quality [18]. Barowicz et al. [1] state, that CLA is a fatty acid which is a positional and geometric isomer of n-6 linoleic (C18:2) acid. Conjugated linoleic acid impacts in a favourable way on humans health because reduces cholesterol level, prevents from heart attacks and some cancers, stimulates immune system and has anti-inflammatory properties [2, 3, 4, 10, 11, 12, 13, 14, 16]. The aim of the paper was to investigate the impact of feeding pigs the fodder with addition of different level of CLA on their meat quality defined by pH value.

Material and methods

The subject of research was 60 crossbred gilts [♂ Irish Landrace x ♀ (♂ Irish Landrace x ♀ Irish Large White)], divided into 6 groups amounted from 10 to 14 individuals each, fed the fodder with addition of conjugated linoleic acid (CLA) in amounts: 0.5 % (CLA 0.5); 1.0 % (CLA 1.0); and 2.0 % (CLA 2.0) or sunflower oil (SFO) also in amounts: 0.5% (SFO 0.5); 1.0 % (SFO 1.0); and 2.0 % (SFO 2.0). Groups getting sunflower oil were treated as control groups and SFO was given for energetic balance of the fodder. Fattening period started with the body weight ca. 40 kg and lasted for 8 weeks. During it ad libitum feeding was used. Animals were slaughtered with the body weight ca. 95 kg. 45 minutes, 2, 3, 4, 5, 6 hours and 24 hours after slaughter pH value of loin meat tissue (Longissimus dorsi – lumbar section) of right half-carcass was determined. Portable pH probe (Orion pH Meter 250 A) equipped with glass-needle electrode (Amagruss Electrodes Ltd.) was used. Results were statistically elaborated using one-way variance analysis. Significance of differences was stated by Duncan test and computer program Statistica PL [15].

## RESULTS

In Table 1 were presented data concerned average values and standard deviations in range of pH value measurement in particular groups. Longissimus dorsi muscle pH values measured 45 minutes after slaughter in case of all groups of pigs were in range from 6.34 up to 6.47, what shows good meat quality. Although, the statistical significant differences were not stated between tested groups of pigs, the lowest $pH_1$ (measured 45 minutes after slaughter) had meat of fatteners where addition of 2 % sunflower oil was given into fodder and the highest value of this trait was in group of individuals where also was given sunflower oil in 1 % amount. Statistical significant differences in pH value measured in different time after slaughter i.e. after 2, 3, 4, 6 and 24

**Table 1.** Meat pH values measured in different time after slaughter
**Tabela 1.** Wartości pH mięsa mierzone w różnym czasie po uboju

| Time of measurement<br>Czas pomiaru | Statistical measure<br>Miara statystyczna | Group<br>Grupa | | | | | |
|---|---|---|---|---|---|---|---|
| | | CLA 0.5 | CLA 1.0 | CLA 2.0 | SFO 0.5 | SFO 1.0 | SFO 2.0 |
| 45 minutes | x | 6.38 | 6.39 | 6.36 | 6.36 | 6.47 | 6.34 |
| 45 minut | s | 0.22 | 0.23 | 0.27 | 0.23 | 0.13 | 0.19 |
| 2 hours | x | 6.17 | 6.06 | 6.07 | 6.09 | 6.19 | 6.11 |
| 2 godziny | s | 0.23 | 0.32 | 0.25 | 0.24 | 0.19 | 0.16 |
| 3 hours | x | 6.07 | 5.94 | 5.85 | 5.91 | 6.03 | 5.98 |
| 3 godziny | s | 0.18 | 0.30 | 0.27 | 0.32 | 0.13 | 0.13 |
| 4 hours | x | 6.00 | 5.75 | 5.80 | 5.87 | 5.92 | 5.91 |
| 4 godziny | s | 0.27 | 0.30 | 0.26 | 0.28 | 0.19 | 0.22 |
| 5 hours | x | 5.97$^{A}$ | 5.67$^{B}$ | 5.72 | 5.88 | 5.83 | 5.83 |
| 5 godzin | s | 0.19 | 0.28 | 0.24 | 0.22 | 0.19 | 0.15 |
| 6 hours | x | 5.89 | 5.76 | 5.73 | 5.81 | 5.86 | 5.73 |
| 6 godzin | s | 0.21 | 0.30 | 0.19 | 0.22 | 0.23 | 0.15 |
| 24 hours | x | 5.68 | 5.63 | 5.56 | 5.69 | 5.60 | 5.62 |
| 24 godziny | s | 0.14 | 0.13 | 0.09 | 0.21 | 0.20 | 0.11 |

Means in rows marked by different letters differ significantly each other; capital letters – $P \leq 0.01$
Średnie oznaczone różnymi literami różnią się istotnie od siebie; wielkie litery – $P \leq 0{,}01$

hours between tested groups of pigs were not stated. The exception is the result of pH measurement 5 hours after slaughter. Statistical significant differences were between group of pigs getting 0.5 % addition of conjugated linoleic acid characterized by the highest pH value of meat and group of animals fed the fodder with 1 % addition of conjugated linoleic acid ($P \leq 0.01$).

## DISCUSSION

Similar results were obtained by Wiegand et al. [17]. They also did not stated differences in $pH_u$ (measured 24 hours after slaughter) between meat of pigs from control and experimental group (getting addition of 0.75 % conjugated linoleic acid into fodder). In cited research were stated lower pH value measured 3 hours after slaughter animals from experimental group. Similar relation did not state in present paper. Eggert et al. [8] also did not state the impact of CLA on pH value measured 24 hours after animals slaughter. Corino et al. [5] did not observe differences in pH value between pigs fed the fodder with addition of conjugated linoleic acid and animals came from control group. Different result was obtained by D'Souza and Mullan [6], because fatteners getting the fodder with addition of conjugated linoleic acid had higher $pH_u$ value than animals came from control group. It was confirmed by Dunshea et al. [7], who stated that meat came from animals fed the fodder with addition of conjugated linoleic acid was darker and had higher $pH_u$.

## CONCLUSIONS

On the basis of the results obtained in presented paper may be stated that feeding pigs with addition of conjugated linoleic acid or sunflower oil in amounts 0.5; 1.0 and 2.0 %, respectively, did not impact negatively on meat quality defined by pH value.

## ACKNOWLEDGEMENTS

Research done within the confines of V European Union Framework (Marie Curie Fellowship) in Ashtown Food Research Centre (Dublin, Ireland).

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